



Natural Resources Conservation Service
P.O. Box 2890
Washington, D.C. 20013

Weekly Report - Snowpack / Drought Monitor Update **Date: 26 March, 2009**

SNOTEL SNOWPACK AND PRECIPITATION SUMMARY

Snow: Snow-water equivalent percent to date shows values within 10 percent of last week's values with a few exceptions as noted over the Southwest and Pacific Northwest. Deficits persist over the areas bordering with Canada while surpluses still exist over the Central Cascades and eastern Nevada (Fig 1). Unofficial forecast changes for the past 7 days in spring and summer streamflow runoff for selected SNOTEL sites show that forecast values have increased over much of the Rockies, Uinta, and Wasatch and decreased over northern New Mexico and southwest Utah (Fig. 1a). This past week's snow depth changes show significant increases over much of the West with the exception of the Cascades and south of southern Utah-Colorado where decreases were common (Fig. 1b).

Temperature: SNOTEL and ACIS-day station average temperature anomalies were below average across most of California, Oregon, and Washington and much above average over the Eastern Plains (Fig. 2). Specifically, the greatest positive temperature departures occurred over Colorado (>+10F) and the greatest negative departures occurred over northern Washington (<-4F) (Fig. 2a).

Precipitation: ACIS 7-day average precipitation anomaly for the period ending 25 March shows a very wet week scattered across the Northern Tier States. The effects from a major spring blizzard can be seen stretching east from Wyoming (Fig. 3). Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2009 Water Year that began on October 1, 2008 shows values remaining pretty much unchanged this week (within +/- 4 percent) with some exceptions over the Southwest (Fig. 3a). For precipitation totals, departures, and percent of normal for several time periods. See: <http://www.water.gov/> and <http://cig.mesonet.org/~derek/public/droughtmonitoring/>.

WESTERN DROUGHT STATUS

The West: During February, California's water-supply situation improved slightly, with the state's 151 intrastate reservoirs collectively gaining 2.365 million acre feet (771 billion gallons). On March 1, the state's cumulative water storage stood at 18.046 million acre feet (5.9 trillion gallons), 72% of average for the date, according to the California Department of Water Resources.

Improvements in storage were due to stormy weather in February and early March that more than doubled the water content of the Sierra Nevada snow pack from 10 to 25 inches. During an average year, the Sierra Nevada snow pack contains an average of approximately 29 inches of liquid by April 1. The mountain snow, which melts during the spring and is captured by a network of reservoirs, provides a crucial source of water for northern and central California. (The Colorado River basin, which includes Lakes Powell and Mead, is also an important source of California's water.)

A 2004 report by the Department of Interior indicated that at the beginning of the 21st century, 79% of California's water was used for agricultural purposes, 17% went to municipal requirements, and the remaining 4% was directed toward industry. Of California's total water use in 2000, 40% came

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from wells and other ground sources, while 60% came from surface supplies such as rivers and reservoirs. From 1950 to 2000, California's annual water use nearly doubled, from 25.0 to 43.1 million acre feet (MAF). During the same period, the state's annual agricultural water consumption climbed from 23.1 to 34.2 MAF, while domestic use surged from 1.6 to 7.2 MAF.

Much of the increase in California's water consumption has been due to a population explosion. According to the California Water Plan, the state's population between 1950 and 2004 surged from 10.7 to 36.5 million, with annual growth rates in recent years around 600,000 people. Another issue complicating the assessment of drought in California is environmental requirements. The California Water Plan (2005 Update), estimated 39.4 MAF of water is used for environmental flows, which are defined to include in-stream requirements, wild and scenic river flows, required Delta outflow, and managed wetlands water use. Some of the environmental water is re-used by urban and agricultural water users.

During the March 17-23 monitoring period, light to occasionally moderate amounts of precipitation (mostly 2 inches or less) fell from the Pacific Northwest eastward into the northern Rockies and southward into the Sierra Nevada. In all locations, totals were not sufficient to appreciably change the water-supply outlook for the spring and summer of 2009.

Farther south, precipitation continued to largely bypass eastern Utah and neighboring areas, where abnormal dryness (D0) was introduced. In the new D0 region, water year-to-date (October 1 – March 24) precipitation averaged just 70 to 80 percent of normal, while the water equivalent of the high-elevation snow pack ranged from 60 to 75 percent of normal. Elsewhere, moderate drought (D1) was expanded in parts of southern New Mexico, where both seasonal precipitation and snow water content are below 50 percent of normal in some river basins. Author: Brad Rippey, U.S. Department of Agriculture

A comprehensive narrative describing drought conditions for the nation can be found at the end of this document.

DROUGHT IMPACTS DEFINITIONS (<http://drought.unl.edu/dm/classify.htm>)

The possible impacts associated with **D4 (H, A)** drought include widespread crop/pasture losses and shortages of water in reservoirs, streams, and wells creating water emergencies. The possible impacts associated with **D3 (H, A)** drought include major crop/pasture losses and widespread water shortages or restrictions. Possible impacts from **D2 (H, A)** drought are focused on water shortages common and water restrictions imposed and crop or pasture losses likely. The possible impacts associated with **D1 (H, A)** drought are focused on water shortages developing in streams, reservoirs, or wells, and some damage to crops and pastures (Figs. 4, 4a, 4b, and 4c).

SOIL MOISTURE

Soil moisture (Figs. 5a and 5b), is simulated by the [VIC macroscale hydrologic model](#). The detailed, physically-based VIC model is driven by observed daily precipitation and temperature maxima and minima from approximately 2130 stations, selected for reporting reliably in real-time and for having records of longer than 45 years (and various other criteria).

OBSERVED FIRE DANGER CLASS

The National Interagency Coordination Center provides a variety of products that describe the current wildfire status for the U.S. - http://activefiremaps.fs.fed.us/lq_fire2.php. The latest Observed Fire Danger Class is shown in Figs. 6 shows the current active wildfires across the West - <http://geomac.usgs.gov/>.

U.S. HISTORICAL STREAMFLOW

This map, (Fig. 7) shows the 7-day average streamflow conditions in hydrologic units of the United States and Puerto Rico for the day of year. The colors represent 7-day average

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streamflow percentiles based on historical streamflow for the day of the year. Thus, the map shows conditions adjusted for this time of the year. Only stations having at least 30 years of record are used. Sub-regions shaded gray indicate that insufficient data were available to compute a reliable 7-day average streamflow value. During winter months, this situation frequently arises due to ice effects. The data used to produce this map are provisional and have not been reviewed or edited. They may be subject to significant change.

http://water.usgs.gov/cgi-bin/waterwatch?state=us&map_type=dryw&web_type=map.

STATE ACTIVITIES

State government drought activities can be tracked at the following URL:

<http://drought.unl.edu/mitigate/mitigate.htm>. NRCS SS/WSF State Office personnel are participating in state drought committee meetings and providing the committees and media with appropriate SS/WSF information - <http://www.wcc.nrcs.usda.gov/cgibin/bor.pl>. Additional information describing the products available from the Drought Monitor can be found at the following URL: <http://drought.unl.edu/dm/>

FOR MORE INFORMATION

The National Water and Climate Center Homepage provide the latest available snowpack and water supply information. Please visit us at <http://www.wcc.nrcs.usda.gov>. This document is available from the following location on the NWCC homepage -

<http://www.wcc.nrcs.usda.gov/water/drought/wdr.pl>

This report uses data and products provided by the Interagency Drought Monitor Consortium members and the National Interagency Fire Center.

/s/ NOLLER HERBERT
Director, Conservation Engineering Division

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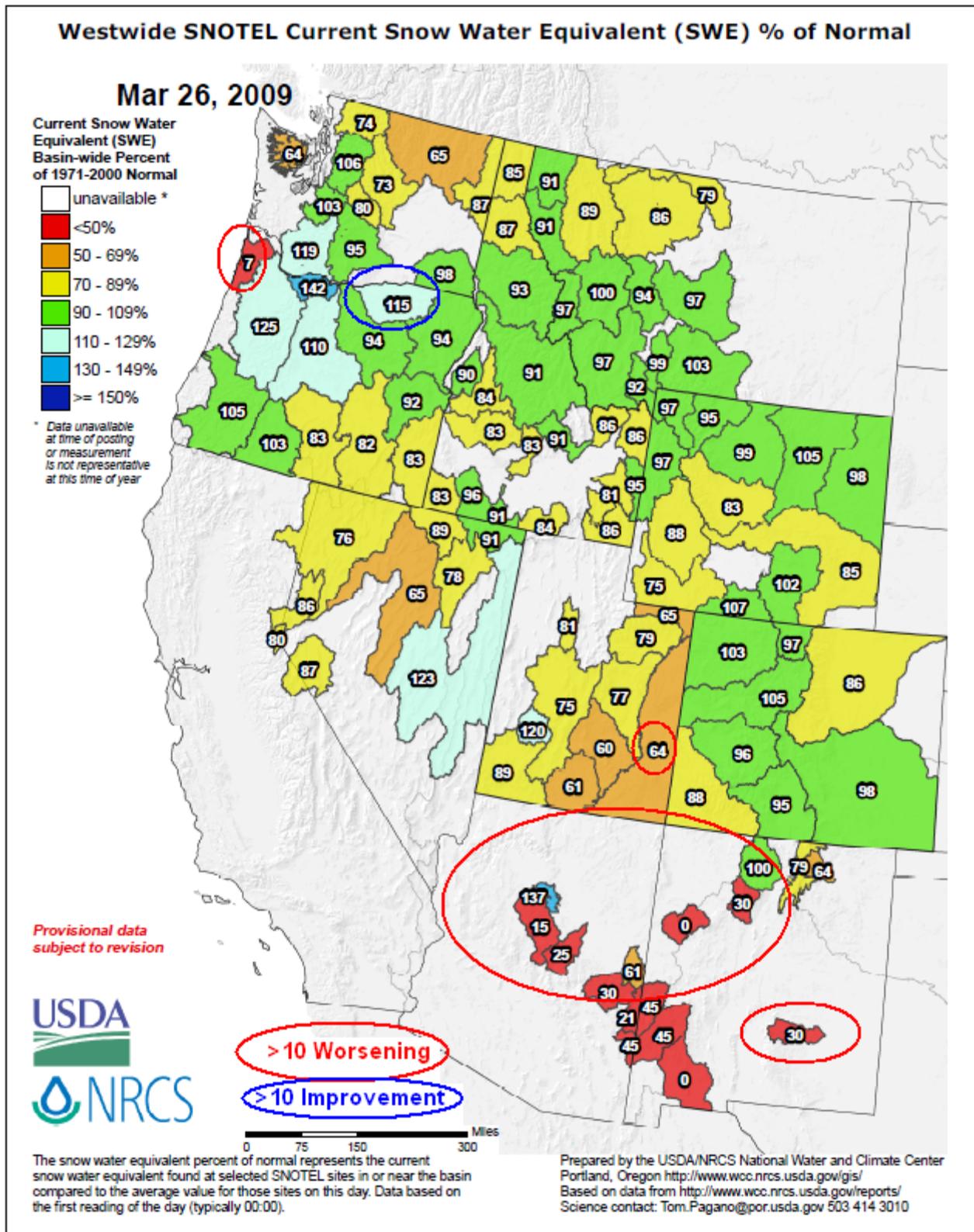


Fig. 1. Snow-water equivalent percent to date shows values within 10 percent of last week's values with a few exceptions as noted. Deficits persist over the areas bordering with Canada while surpluses still exist over the Central Cascades and eastern Nevada.

Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west_swepctnormal_update.pdf

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7-Day Guidance Forecast Change as Percent of 1971-2000 Normal

Mar 26, 2009

For guidance only

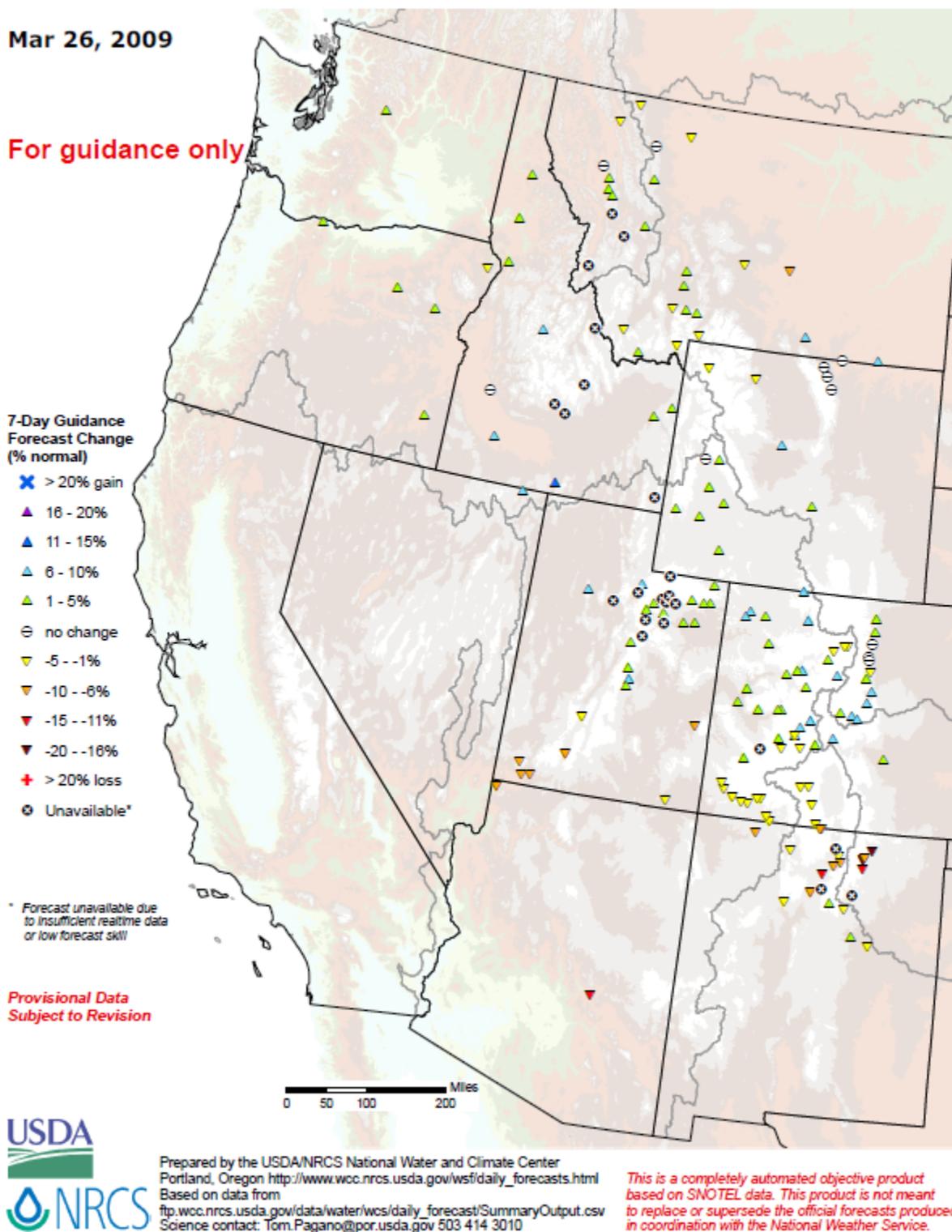


Fig. 1a: Selected preliminary daily water supply forecast changes since last week show that forecast values have increased over much of the Rockies, Uinta, and Wasatch and decreased over northern New Mexico and southwest Utah.

Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/daily_forecast/maps/west_dailyfcst_7daych.pdf

SNOTEL 7-Day Snow Depth Change (Inches)

Mar 26, 2009

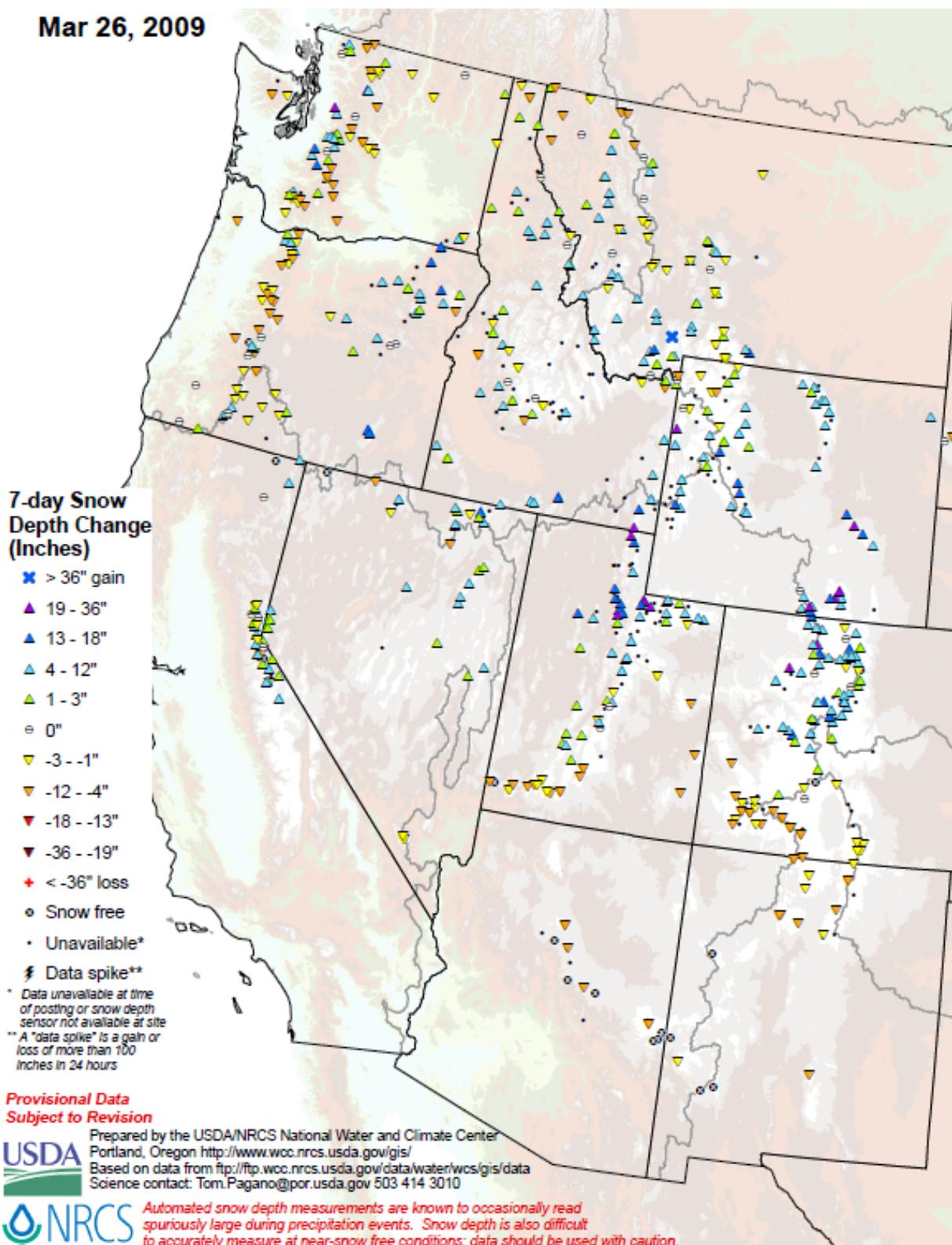


Fig. 1b: This past week's snow depth changes show significant increases over much of the West with the exception of the Cascades and south of southern Utah-Colorado.

Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west_snowdepth_7ddelta.pdf

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SNOTEL (solid) and ACIS (dot-filled) Networks 7-Day Average Temperature Anomaly (Degrees F)

Mar 26, 2009

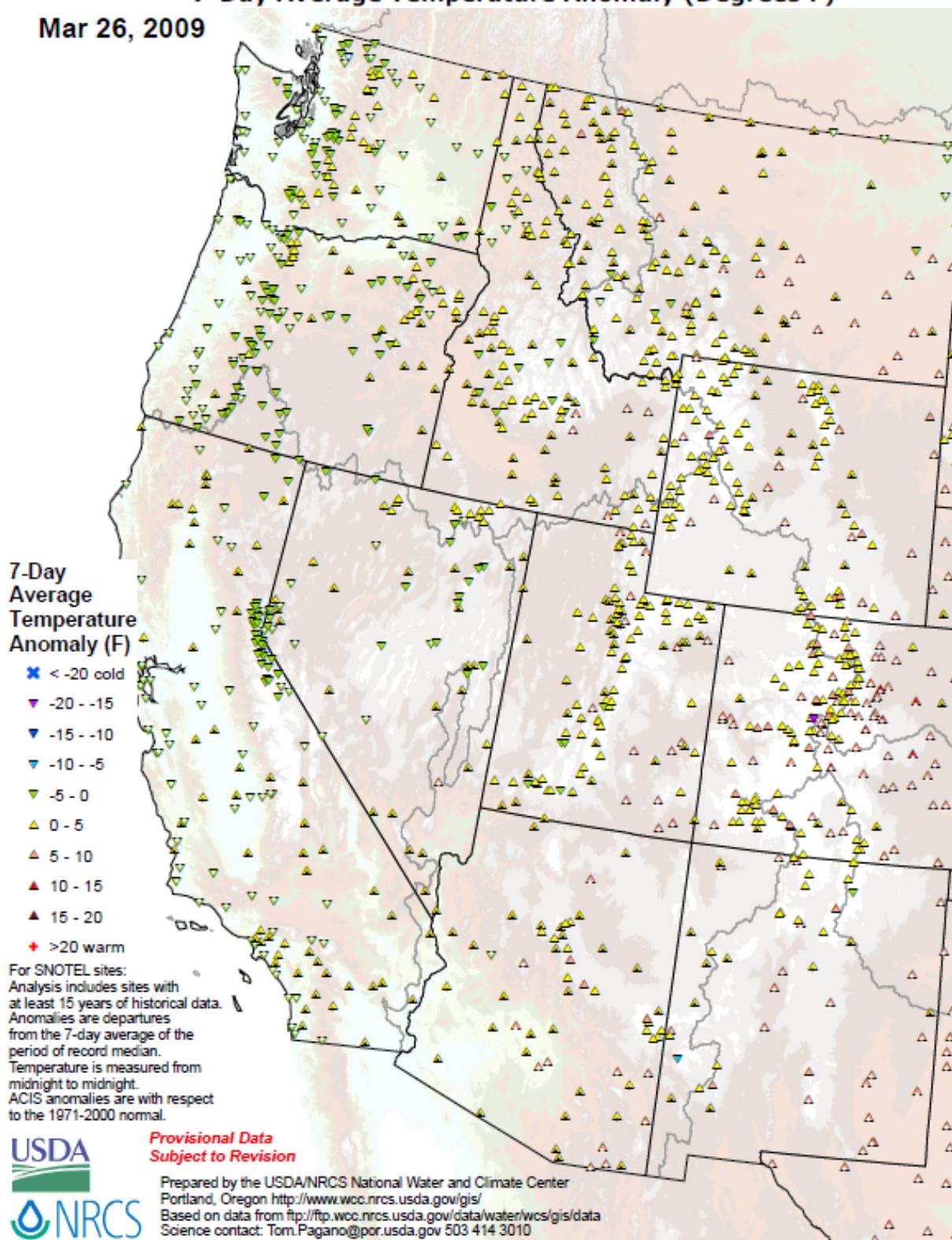
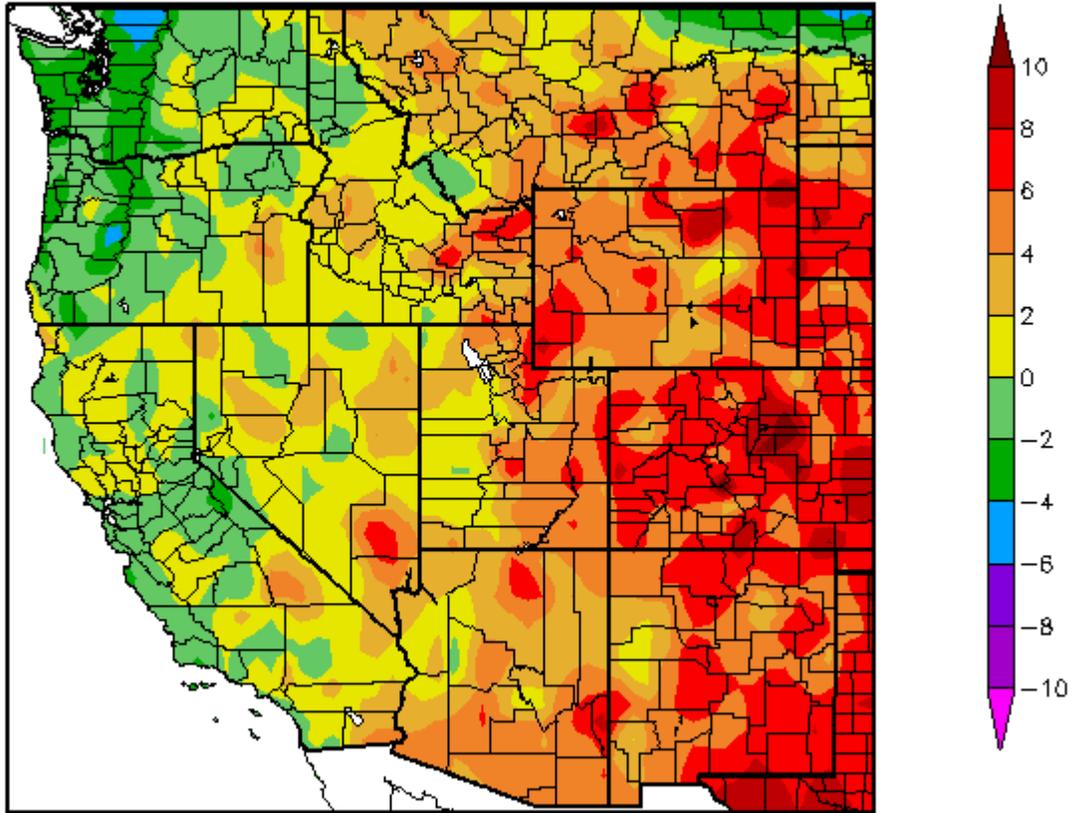


Fig. 2. SNOTEL and ACIS-day station average temperature anomalies were below average across most of California, Oregon, and Washington and much above average over the Eastern Plains.

Ref: <ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/WestwideTavg7dAnomalyAcis.pdf>

Departure from Normal Temperature (F)
3/19/2009 – 3/25/2009



Generated 3/26/2009 at HPRCC using provisional data.

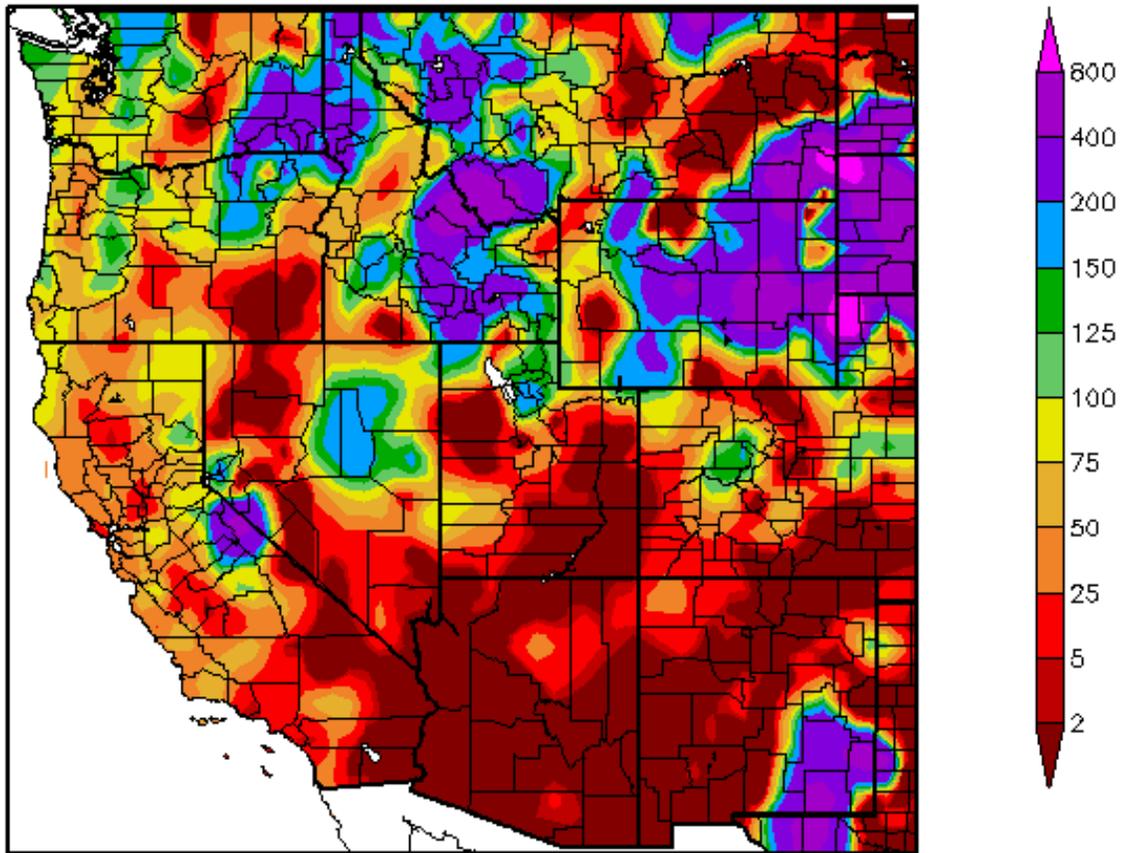
NOAA Regional Climate Centers

Fig. 2a. ACIS 7-day average temperature anomalies show that the greatest positive temperature departures occurred over Colorado (>+10F) and the greatest negative departures occurred over northern Washington (<-4F).

Ref:

http://www.hprcc.unl.edu/maps/current/index.php?action=update_product&product=TDept

Percent of Normal Precipitation (%)
3/19/2009 – 3/25/2009



Generated 3/26/2009 at HPRCC using provisional data.

NOAA Regional Climate Centers

Fig. 3. ACIS 7-day average precipitation anomaly for the period ending 25 March shows a very wet week scattered across the Northern Tier States. The effects from a major spring blizzard can be seen stretching east from Wyoming.

Ref: http://www.hprcc.unl.edu/maps/index.php?action=update_product&product=PNorm

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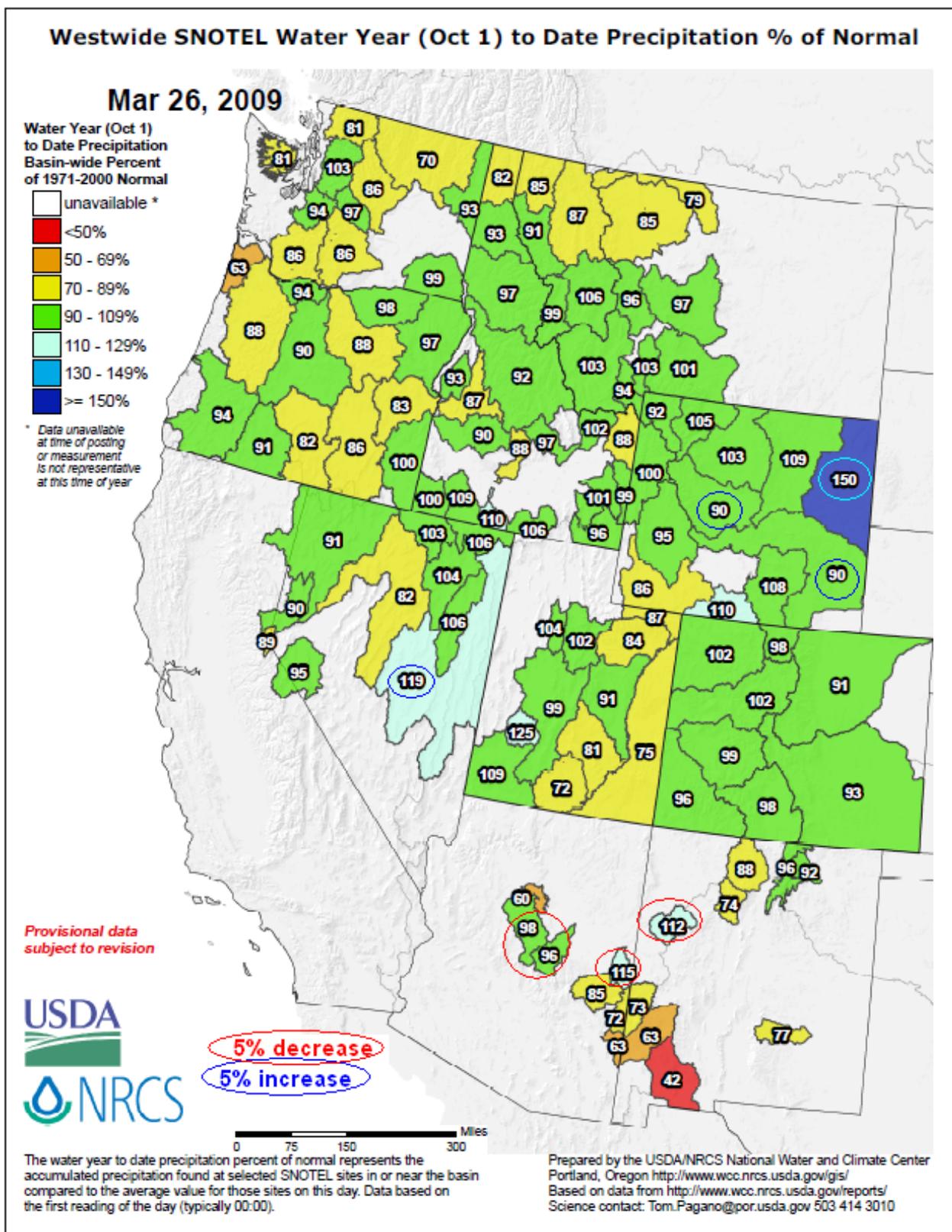
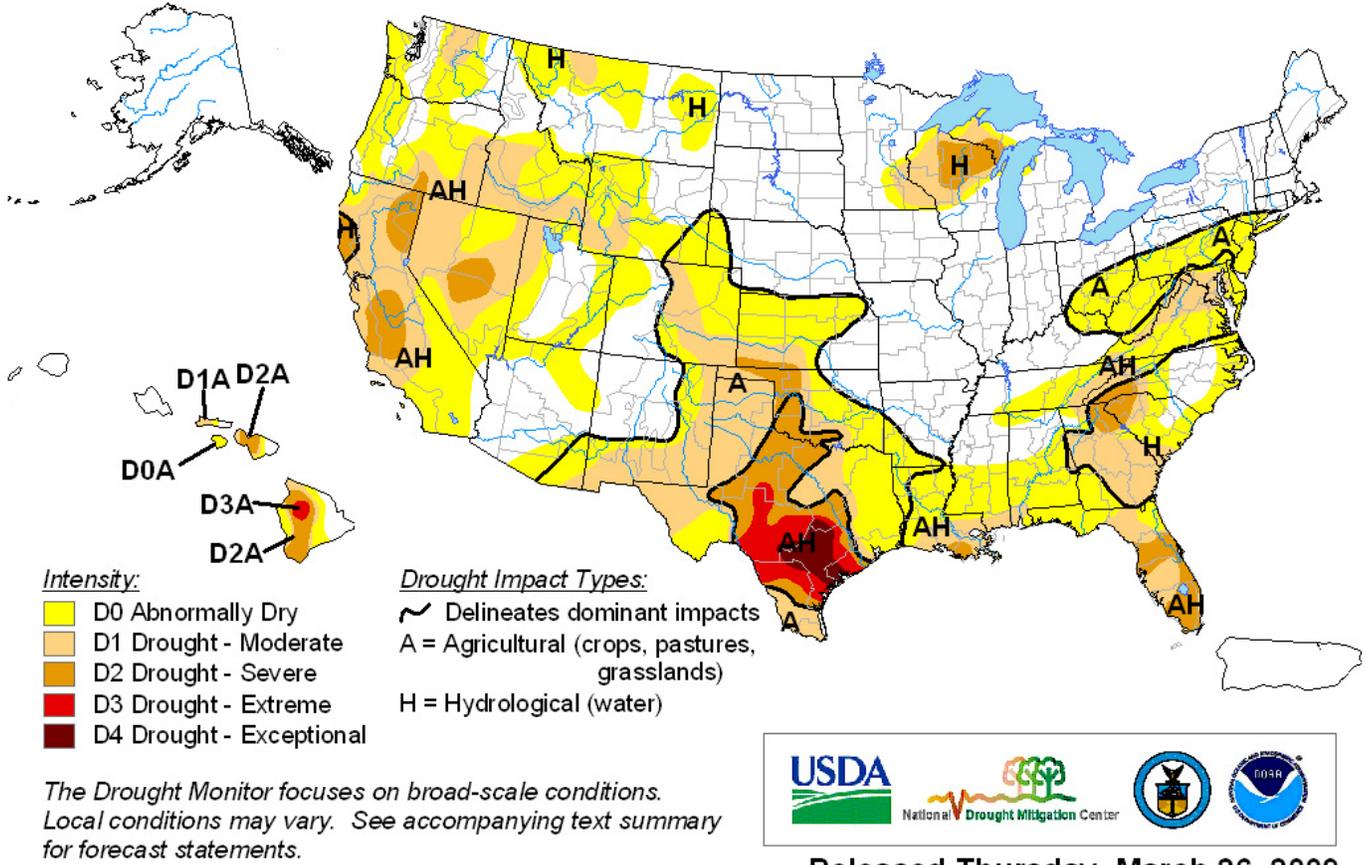


Fig 3a. Seasonal precipitation (rain & snow water equivalent) as a percent of normal for the 2009 Water Year that began on October 1, 2008 shows values remaining pretty much unchanged this week (within +/- 4 percent) with the exceptions as noted.

Ref: ftp://ftp.wcc.nrcs.usda.gov/data/water/wcs/gis/maps/west_wytdprecpcnormal_update.pdf

U.S. Drought Monitor

March 24, 2009
Valid 8 a.m. EDT



Released Thursday, March 26, 2009

Author: Brad Rippey, U.S. Department of Agriculture

<http://drought.unl.edu/dm>

Fig. 4. Current Drought Monitor weekly summary.

Ref: National Drought Mitigation Center (NDMC) - <http://www.drought.unl.edu/dm/monitor.html>

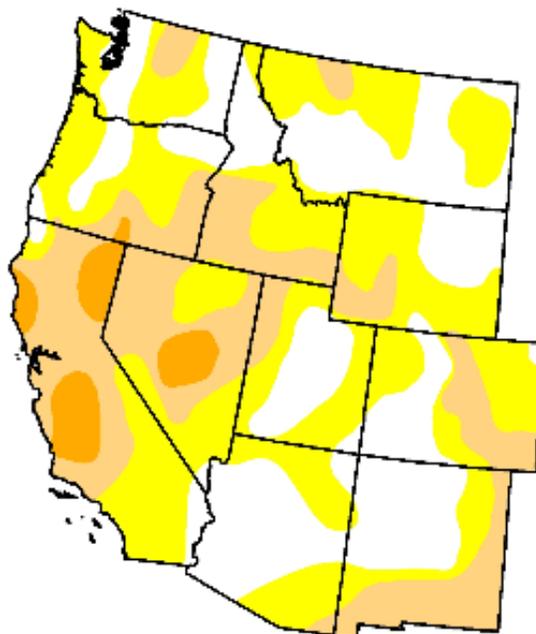
U.S. Drought Monitor

West

March 24, 2009
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	31.7	68.3	28.5	4.2	0.0	0.0
Last Week (03/17/2009 map)	33.4	66.6	25.8	4.2	0.0	0.0
3 Months Ago (12/30/2008 map)	35.4	64.7	28.9	9.0	0.4	0.0
Start of Calendar Year (01/06/2009 map)	37.4	62.6	28.9	8.8	0.4	0.0
Start of Water Year (10/07/2008 map)	41.3	58.7	28.6	10.4	0.1	0.0
One Year Ago (03/25/2008 map)	41.4	58.6	36.4	15.4	0.0	0.0



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements

<http://drought.unl.edu/dm>



Released Thursday, March 26, 2009
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Fig. 4a. Drought Monitor for the Western States with statistics over various time periods. No significant change this week. Ref: http://www.drought.unl.edu/dm/DM_west.htm

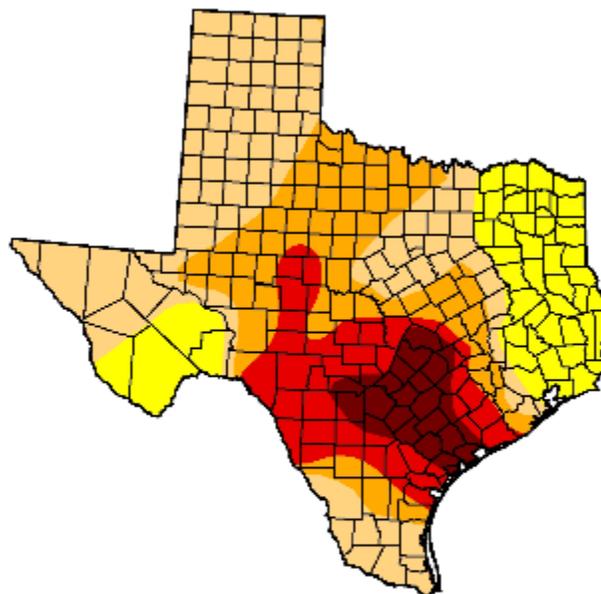
U.S. Drought Monitor

Texas

March 24, 2009
Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.0	100.0	80.7	44.0	21.6	7.1
Last Week (03/17/2009 map)	0.0	100.0	71.0	43.9	19.8	7.1
3 Months Ago (12/30/2008 map)	48.1	51.9	24.5	15.0	9.1	4.2
Start of Calendar Year (01/06/2009 map)	41.7	58.3	24.5	15.0	9.1	4.2
Start of Water Year (10/07/2008 map)	67.2	32.8	20.5	11.0	3.6	0.0
One Year Ago (03/25/2008 map)	33.8	66.2	44.6	11.3	3.9	0.0



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
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<http://drought.unl.edu/dm>

Fig. 4b: Texas is the only state with D4 drought condition in the US. Note some deterioration since last week. Ref: http://www.drought.unl.edu/dm/DM_state.htm?TX.S

Drought Monitor Classification Changes for Selected Time Periods

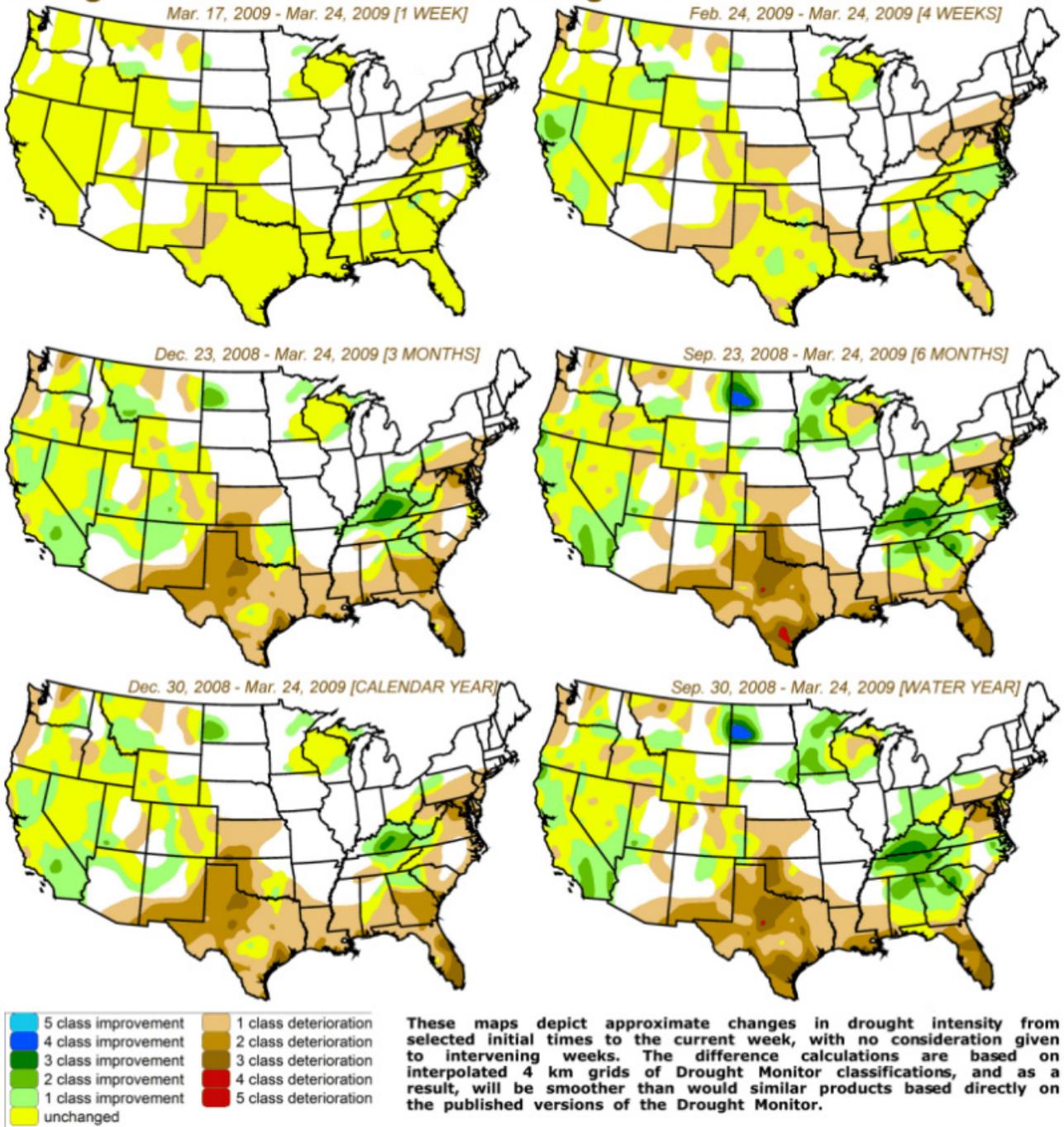
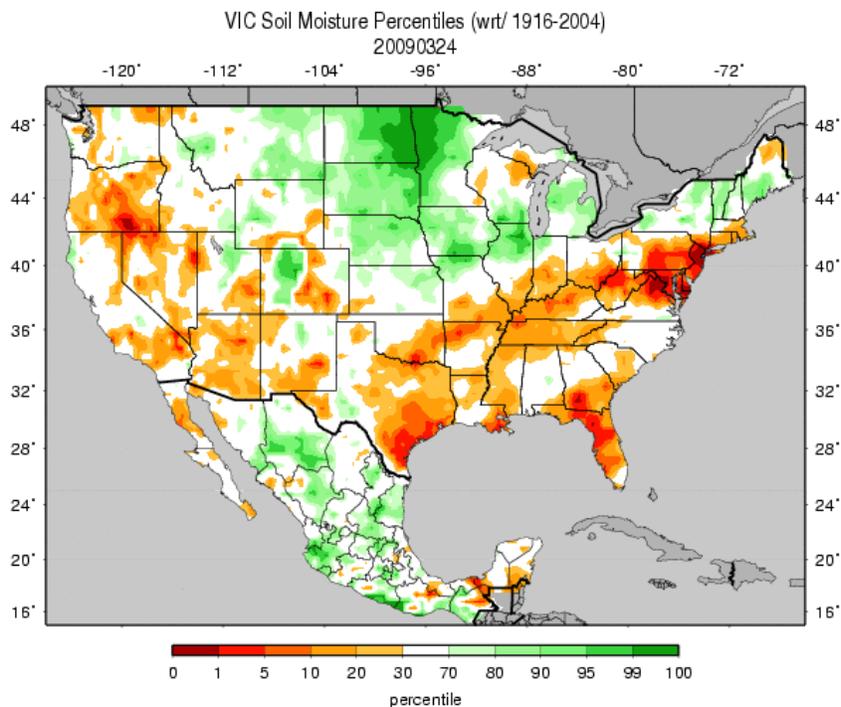


Fig. 4c: Drought Monitor classification changes for selected time periods.

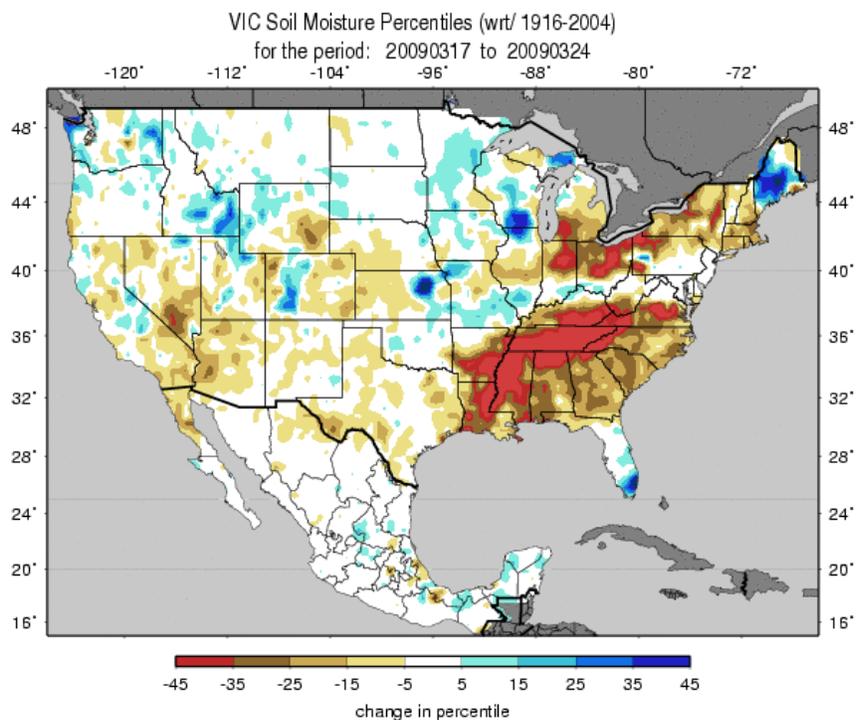
Ref: <http://www.cpc.ncep.noaa.gov/products/predictions/experimental/edb/dm-change-4maps.png>

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Figs. 5a: Soil Moisture ranking in percentile based on 1916-2004 climatology for this past week. Near saturation exists over the Northern Plain while excessive dryness dominates from New Jersey to eastern Texas and Florida. Oregon still remains drier than average.

Ref: http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt.gif



Figs. 5b: Soil Moisture change in percentile based on 1916-2004 climatology for this past week. Note significant worsening over much of the eastern half of the country with the exception of Maine, Michigan, and southern Florida. Ref:

http://www.hydro.washington.edu/forecast/monitor/curr/conus.mexico/CONUS.MEXICO.vic.sm_qnt.1wk.gif

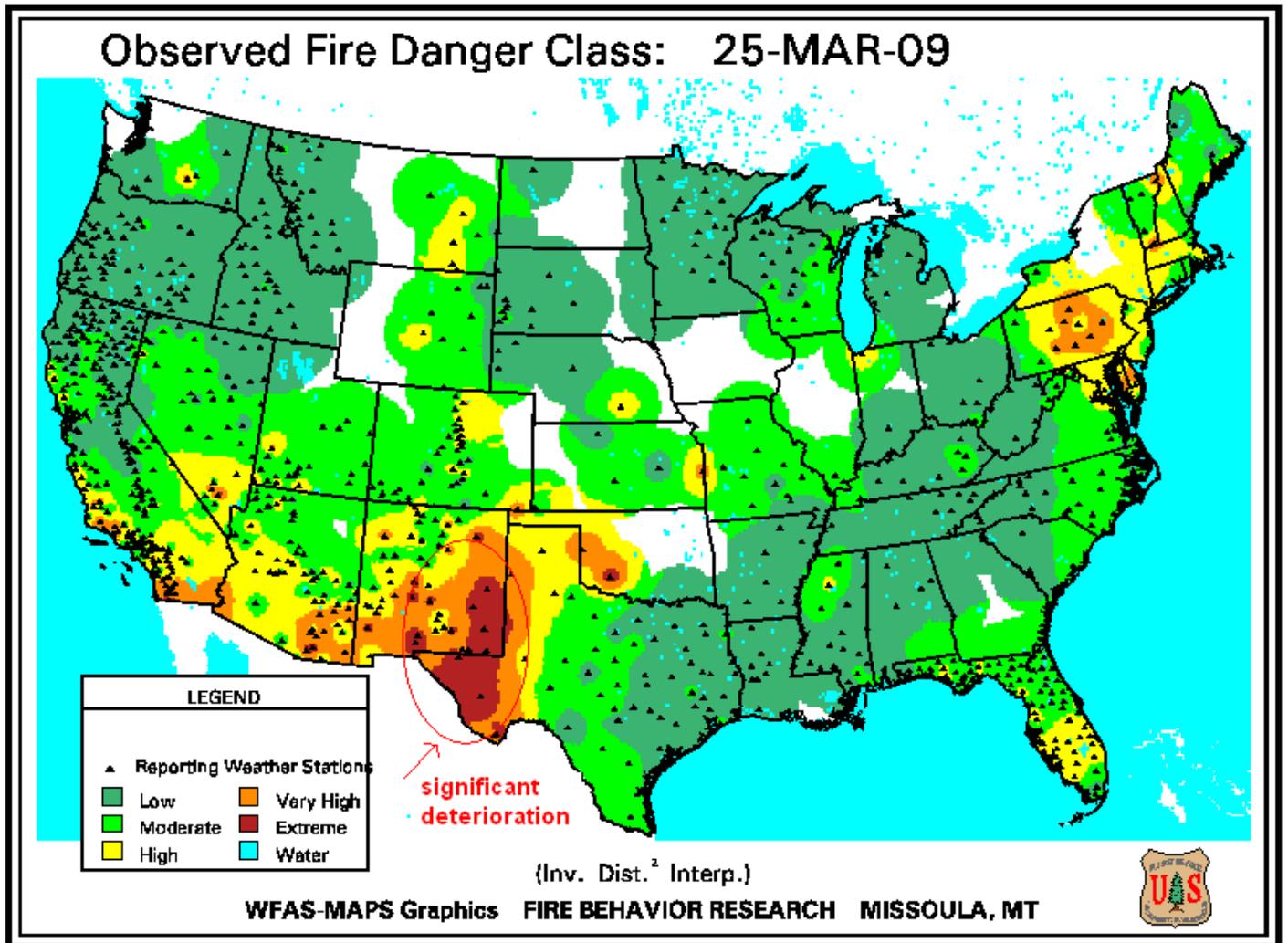


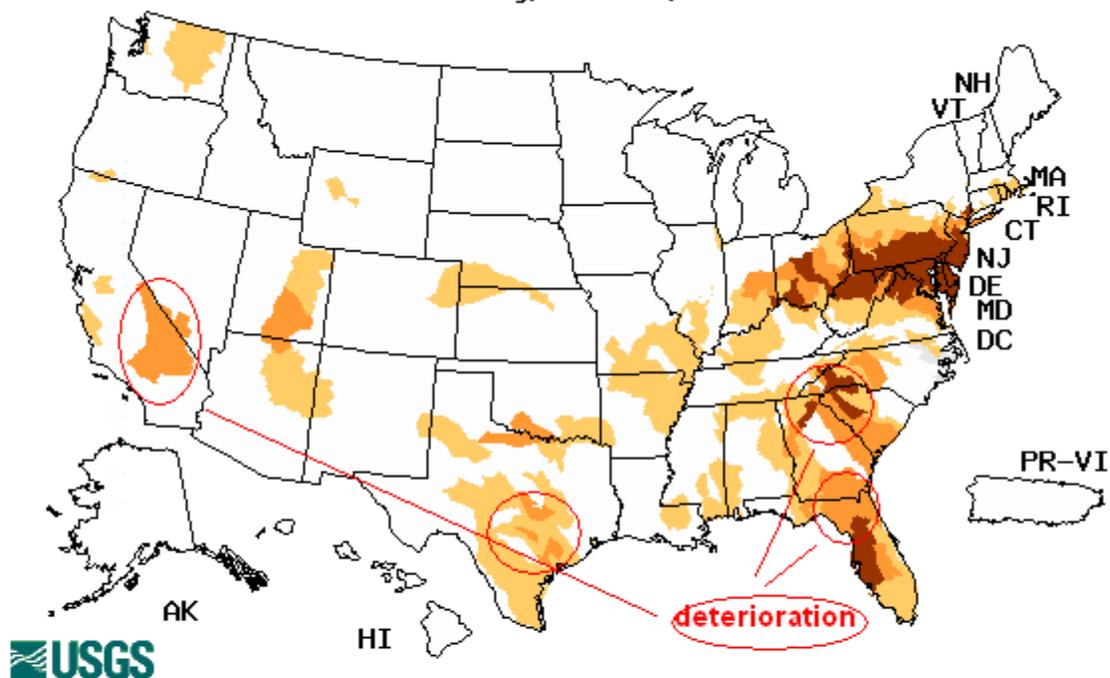
Fig. 6. Observed Fire Danger Class. Conditions have deteriorated further over western Texas and eastern New Mexico since last week.

Source: Forest Service Fire Behavior Research – Missoula, MT.

Ref: http://www.fs.fed.us/land/wfas/fd_class.gif

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Wednesday, March 25, 2009



Explanation - Percentile classes				
Low	≤5	6-9	10-24	insufficient data for a hydrologic region
Extreme hydrologic drought	Severe hydrologic drought	Moderate hydrologic drought	Below normal	

Fig. 7. Map of below normal 7-day average streamflow compared to historical streamflow for the day of year. Conditions are very poor from New Jersey to eastern Kentucky and western Florida during the past week. Elsewhere, over the Northern Tier States, cold temperatures have probably frozen rivers and thus do not necessarily reflect accurate flows. **Note: The Red River in North Dakota is expected to reach record flood stage next week.**

Ref: <http://water.usgs.gov/waterwatch/?m=dryw&w=map&r=us>

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National Drought Summary – March 24, 2009

The discussion in the Looking Ahead section is simply a description of what the official national guidance from the National Weather Service (NWS) National Centers for Environmental Prediction is depicting for current areas of dryness and drought. The NWS forecast products utilized include the HPC 5-day QPF and 5-day Mean Temperature progs, the 6-10 Day Outlooks of Temperature and Precipitation Probability, and the 8-14 Day Outlooks of Temperature and Precipitation Probability, valid as of late Wednesday afternoon of the USDM release week. The NWS forecast web page used for this section is: <http://www.cpc.ncep.noaa.gov/products/forecasts/>.

The Southeastern and Mid-Atlantic States: Short-term dryness continued to intensify across the middle Ohio Valley and the Mid-Atlantic States, resulting in a broad expansion of abnormal dryness (D0) and moderate drought (D1). In the region of D1, Baltimore, Maryland, has endured its driest start to a calendar year during the nearly 140-year period of record. Through March 24, Baltimore's year-to-date precipitation stood at 3.79 inches, just 40% of normal.

Meanwhile, more information about the impact of the previous week's 2- to 6-inch Southeastern rainfall totals resulted in additional reductions in drought coverage in intensity. Extreme drought (D3) was removed from the southern Appalachians, and the coverage of severe drought (D2) was reduced. Much of the remaining moderate drought (D1) in east-central and southeastern Alabama was also removed, as stream flows in this area remained robust in the wake of mid-March downpours.

Heavy rain fell in southeastern Florida, mainly in and near some of the east coast cities, but largely bypassed the remainder of the parched peninsula. March 17-21 rainfall totaled 2.81 inches in Ft. Lauderdale, with nearby amounts locally ranging from 6 to 10 inches. However, Ft. Lauderdale recently completed its driest winter on record, with a December-February rainfall total of just 0.39 inch (5% of normal). Nevertheless, some severe drought (D2) was removed from the hardest-hit areas of southeastern Florida, replaced by abnormal dryness and moderate drought (D0 and D1). Elsewhere, there was some modest expansion of severe drought (D2) deeper into interior southern Florida, including all of Lake Okeechobee. The level of Lake Okeechobee has been falling steadily since a few weeks after the August 2008 passage of Tropical Storm Fay, and the lake's average surface elevation on March 24 stood at 12.32 feet (about 2 feet below the 1965-2007 average for the date).

The Great Lakes Region: Precipitation associated with a major spring storm moved into the upper Great Lakes region toward the end of the monitoring period. Rainfall totals in excess of 1 inch resulted in the removal of abnormal dryness (D0) from northeastern Minnesota, and a slight reduction in the coverage of abnormal dryness and moderate drought (D0 and D1) in south-central Minnesota.

The Plains: A strong, early-spring storm brought a variety of weather conditions to the nation's mid-section from March 22-24. Blizzard conditions engulfed the High Plains from eastern Wyoming and western Nebraska into the western Dakotas, while severe thunderstorms raked portions of the east-central and southeastern Plains. More than a dozen tornadoes were spotted on March 23 from the middle Missouri Valley southward into Oklahoma.

Abnormal dryness (D0) was eliminated from western North Dakota, where snowfall totals of 1 to 2 feet were observed. The coverage of D0 was reduced in some snow-affected areas, including central and east-central Wyoming. However, the storm brought little or no precipitation to the central and southern High Plains, where pastures, rangeland, and winter grains continued to suffer. Moderate drought (D1) was introduced across much of eastern New Mexico and west-central Texas, and expanded in southeastern Colorado. Severe drought (D2) was expanded slightly in western Oklahoma, while abnormal dryness (D0) was lifted northward to near the Kansas-Nebraska border. According to U. S. Department of Agriculture, topsoil moisture across the western one-third

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of Kansas ranged from 86% very short to short in the northwest to 100% in the southwest. USDA also reported that more than half (57%) of the Texas winter wheat crop was rated in very poor to poor condition on March 22. Elsewhere, Oklahoma's wheat was rated 40% very poor to poor on March 22, along with 19% of the crop in Colorado and 18% in Kansas.

The West: During February, California's water-supply situation improved slightly, with the state's 151 intrastate reservoirs collectively gaining 2.365 million acre feet (771 billion gallons). On March 1, the state's cumulative water storage stood at 18.046 million acre feet (5.9 trillion gallons), 72% of average for the date, according to the California Department of Water Resources.

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Farther south, precipitation continued to largely bypass eastern Utah and neighboring areas, where abnormal dryness (D0) was introduced. In the new D0 region, water year-to-date (October 1 – March 24) precipitation averaged just 70 to 80 percent of normal, while the water equivalent of the high-elevation snow pack ranged from 60 to 75 percent of normal. Elsewhere, moderate drought (D1) was expanded in parts of southern New Mexico, where both seasonal precipitation and snow water content are below 50 percent of normal in some river basins.

Alaska, Hawaii, and Puerto Rico: Alaska and Puerto Rico remained free of dryness and drought. Meanwhile, no changes were introduced in Hawaii, despite locally heavy showers in windward locations. Hawaiian drought persists primarily in leeward sections of Molokai, Maui, and the Big Island.

Looking Ahead: For the remainder of the week, a major spring storm system crossing the U.S. will produce heavy snow in the central and southern Rockies on March 26-27 and the southern Plains on March 27-28. Snowfall accumulations in excess of 8 inches may occur from the Rockies of

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Colorado and New Mexico southeastward into parts of Oklahoma and Texas' northern panhandle. Farther east, torrential rainfall could result in March 26-30 rainfall totals as high as 3 to 9 inches from the lower Mississippi Valley to the southern Appalachians. Severe thunderstorms, bearing high winds, large hail, and isolated tornadoes, could accompany the Southeastern downpours. Meanwhile, as much as 1 to 2 inches of rain will fall from the Ohio and middle Mississippi Valleys into the Northeast. Elsewhere, mostly dry conditions will persist through March 30 in southern Florida and from California to the lower Rio Grande Valley, while cool, showery weather will persist in the northern Rockies and the Pacific Northwest.

The CPC 6- to 10-day forecast for (March 31 – April 4) calls for cooler-than-normal weather across the western half of the U.S., while near- to above-normal temperatures will prevail in the East. Meanwhile, above-normal precipitation from the Pacific Northwest to the upper Great Lakes region will contrast with drier-than-normal conditions from California to the southern Plains.

Author: Brad Rippey, U.S. Department of Agriculture

Dryness Categories

D0...Abnormally Dry...used for areas showing dryness but not yet in drought, or for areas recovering from drought.

Drought Intensity Categories

D1...Moderate Drought

D2...Severe Drought

D3...Extreme Drought

D4...Exceptional Drought

Drought or Dryness Types

A...Agricultural

H...Hydrological

Updated: 26 March 2009